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No. 2.

AN ACCOUNT
OF THE
BRITISH
HYDROID ZOOPHYTES

COLLECTED BY

PHILIP JAMES RUFFORD

F.G.S.

*And exhibited in Cases in the
Hastings and St. Leonards Museum.*

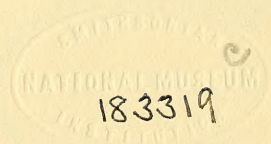
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PART II.

AN ACCOUNT

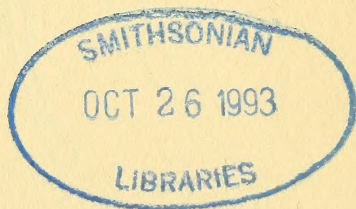
— OF THE —

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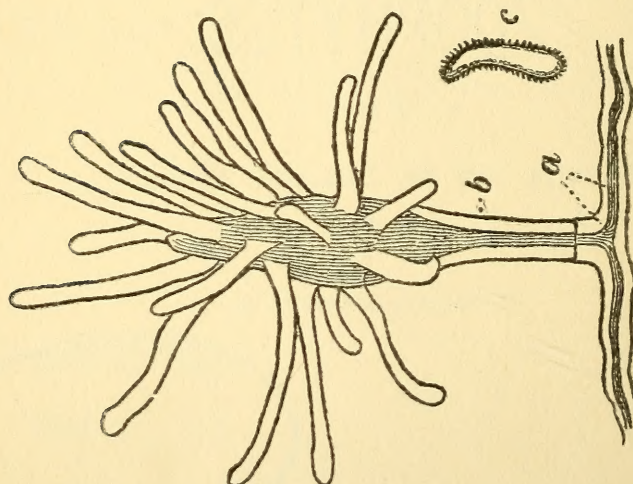


Fig. 2.—An ATHEBATE, or Polypite destitute of horny covering.
 (a).—Polypary. (b).—Naked Polypite.
 (c).—A Planule.

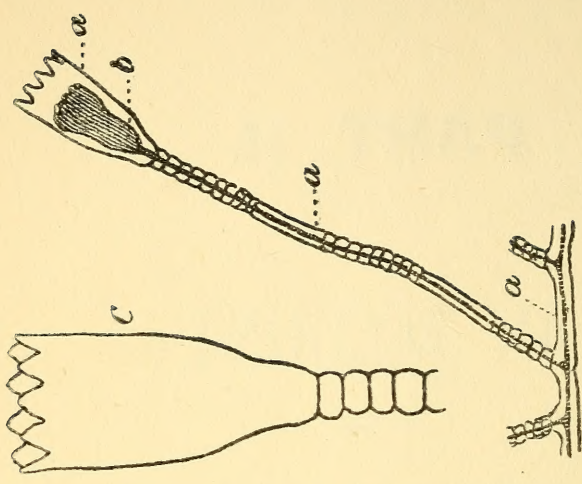


Fig. 3.—A THECAPHOREAN Polypite provided with a horny covering, or receptacle.
 (a).—Polypary. (b).—Polypite withdrawn.
 (c).—Receptacle enlarged.

AUTHOR'S PREFACE.

The writer would like at the outset to acknowledge his great indebtedness to Hincks' work on the "Hydroid Zoophytes." He has, however, studied the local species sufficiently carefully in their haunts, and with the microscope, to enable him to write from personal observation.

The figures, except those ascribed to other authors, are from sketches from nature by the author.

The specimens in the Collection here described (unless otherwise stated) were presented to the Hastings and St. Leonards Museum, in 1899, by the Author.

P. J. RUFFORD.

October, 1899.

INTRODUCTORY REMARKS

BY

MRS. ALICE RUFFORD.

A short description may be desirable to acquaint the reader with the reason which has led me to publish this volume.

Some years ago it was resolved by the Committee of the Hastings Museum Association that the exhibits in the various sections should be catalogued. The Hon. Secretary, Mr. Crake, asked Mr. Rufford to begin by making a list of the specimens of the lower forms of Marine Fauna, giving a short description of each. This work he gladly undertook; but, finding it impossible to compress in a few words such a definition as would be of any use to a student, he produced the following illustrated catalogue which was acquired by the Association, by whom, but for lack of funds it would have been published. That I am now able to do so is owing to the generosity of the Committee in returning me the MS., and I offer them my sincere thanks for their courtesy.

I wish also to tender my hearty thanks to Mr. Connold, F.E.S., for undertaking the Editorship, contributing some pages, producing photographs for nineteen plates and relieving me of all care and anxiety; to Mr. Seward, F.R.S., for his sympathetic Appreciation, and to Dr. Woodward, F.R.S., who kindly obtained permission from the Trustees of the British Museum (South Kensington) to reproduce Plate XXI.; and lastly to Mr. Crake who constantly helped and encouraged Mr. Rufford in his work, for his kind contribution.

Knowing how strongly my late husband was imbued with the idea of the Educational value of Museums, I hope this little tribute to his memory will be found helpful to future students of the extremely beautiful and interesting Marine Fauna and Geology of Hastings.

ALICE RUFFORD.

37 MAGDALEN ROAD,
ST. LEONARDS-ON-SEA.

1902.

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CORRIGENDA.

Page 55, line 4 from top, for **Perigonimus** read **Perigoniums**.
" 79, " 9 " " " **Hinck's** read **Hincks'**.

PART II.

AN ACCOUNT

— OF THE —

BRITISH HYDROID ZOOPHYTES

— IN THE —

Hastings and St. Leonards Museum.

The specimens were collected at **HASTINGS** by
Philip James Rufford.

(The following classification is after Hincks).

Sub-kingdom—**CŒLENTERATA**.

Class—**HYDROZOA**.

Order I.—**HYDROIDA**.

Sub-order I.—**ATHECATA (CORYNIDA)**.

*Polypites naked—not provided with horny
receptacles.*

Family.—**CLAVIDÆ**.

Clava multicornis, Forstäl.

1 specimen in liquid.

SPECIMEN The Polypite is club- or spindle-
1. shaped, with the tentacles
distributed over the body, the mouth being
protruded conically. The gonophores are
borne in clusters below the tentacles. This
Hydroid is found creeping over stones, shells
and seaweed, near low water, somewhat as
Ivy trails over a wall; the adherent, creeping

stem throwing up, here and there, erect, slightly pink, and short polypites. The polypary rises only just above the creeping base. It is not common locally.

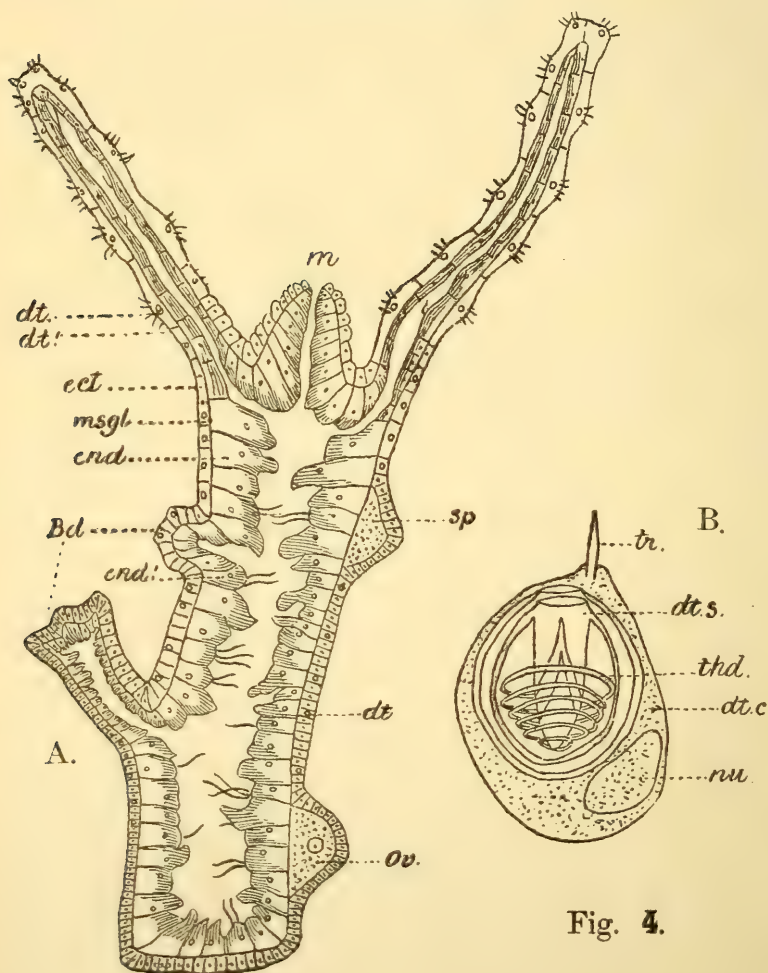


Fig. 4.

EXPLANATION OF FIG. 4.

The Structure of a typical Hydroid (Hydra), and the distinctive difference between Budding and Ova production ; also a dart cell.

(From Parker and Haswell, after Schneider).

A.

<i>m.</i>	Mouth.
<i>end.</i>	Endoderm cell with pseudopodium.
<i>end'</i>	Endoderm cell with flagella.
<i>msgl.</i>	Mesoglæa, intermediate membrane.
<i>ect.</i>	Ectoderm
<i>dt.</i>	Large dart cells.
<i>dt'</i>	Small dart cells.
<i>bd.</i>	Bud.
<i>ov.</i>	Ovum.
<i>sp.</i>	Spermarium.

B.

<i>tr.</i>	"Trigger-hair."
<i>dt. s.</i>	Dart sack.
<i>thd.</i>	Thread coiled within the sack.
<i>dt. c.</i>	Dart cell.
<i>nu.</i>	Nucleus.

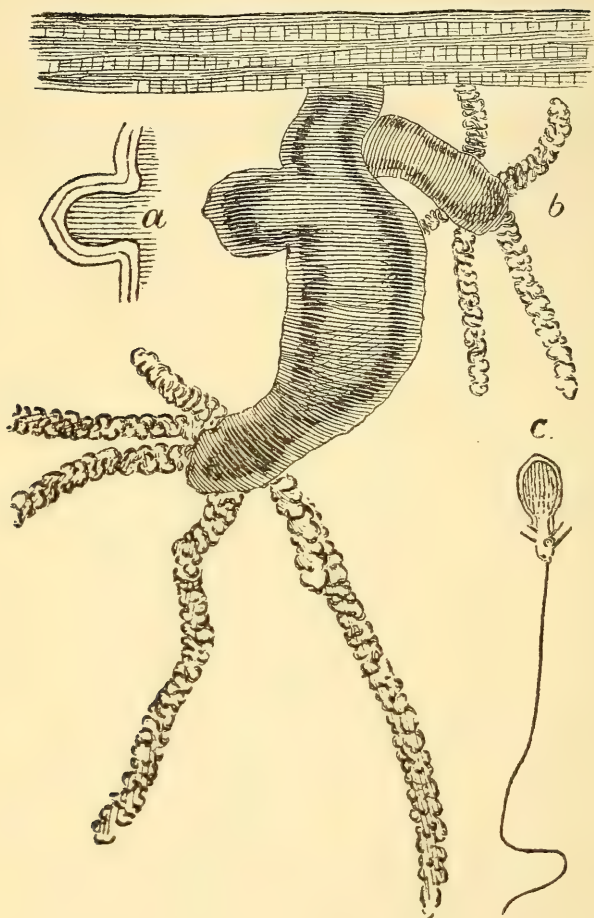


Fig. 5—*Hydra vulgaris*, Linnæus.

A solitary polypite.

(a).—Young bud, or “inflation” of body wall. Tentacles not yet formed.

(b).—More mature bud, with tentacles.

(c).—Dart.

Family.—HYDRACTINIIDÆ.

Hydractinia echinata, Fleming. (Fig. 7).

1 specimen dry and 1 in liquid.

SPECIMENS This Hydroid is peculiar on
2, 3. account of the form of the chitinous skeleton, and of the diversity of the members composing the colony. It is found at low or in deep water, encrusting whelk and other univalve shells inhabited by the common Hermit crab. According to Hincks, it is always found under these conditions, but we have found it on one occasion, on the claws of a large Lobster.

The ordinary alimentary polypite is white or pink, and in form very like the last species, but the tentacles are arranged in a single circle. In the "select" polypites, the tentacles are reduced almost to *nil*, but the remnants are well provided with dart sacks. The gonophores are collected together on the body, and are generally pink in colour. Besides these members, there are others similar in form, but much longer, and which have the habit of coiling themselves up, but they do not bear gonophores. They are

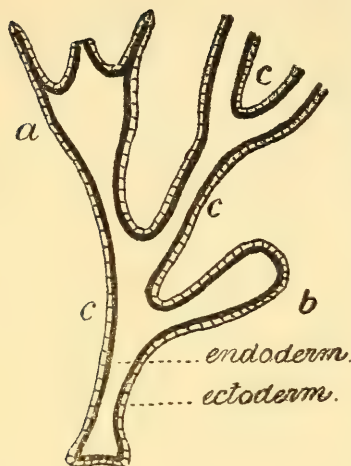


Fig. 6.—Diagram to show the nature of "Budding."

(a).—Mature polypite.

(b).—Young bud, or "inflation" of the endoderm and ectoderm of parent—mouth and tentacles yet to be formed.

(c).—Coenosarc, or connective parts.

mainly found around the mouth of the shell and are the "snake-like appendages" of Hincks. There is yet another modification. Certain long, linear, worm-like bodies, very contractile, with no tentacles or mouth, but well provided with dart

sacks, whose function appears to have relation to either the special protection of the colony, or to be

instrumental in procuring food for it. They are not generally distributed, but are found massed together. In some cases (if not in all) the walls of these attenuated worm-like bodies contain dart sacks. The heads appear to have a bi-lateral form. It is possible, as Hincks has pointed

out, that these, and the "snake-like" bodies may have analogy with the nematophores found in the PLUMULARIIDÆ, or to certain organs in *Ophiodes*.

The nature of the chitinous crust is not very clear. The plan, however, appears to be a system of horizontal horny tubes more or less irregular, compressed closely against one another, and opening into each other, thus forming a sheet which covers the surface of the whelk shell. The exposed surface of the tubes, or crust, is perforated similarly to perforated zinc, and allows the cœnosarc which fills up the interior of the tubes, also to overspread the outer surface of the crust. From this surface layer of cœnosarc the naked polypites emanate.

This species is named *Echinata*, from the spiny character of the crust, the spines evidently serving to protect the polypites from friction against objects in the many close corners into which the Hermit crab takes them. Beneath these spines, or pinnacles, the polypites crouch and remain unharmed.

As to the advantages to be derived from an association of crab and polypites, the latter, doubtless, partake of the crumbs that fall from the rich man's table, and also feed

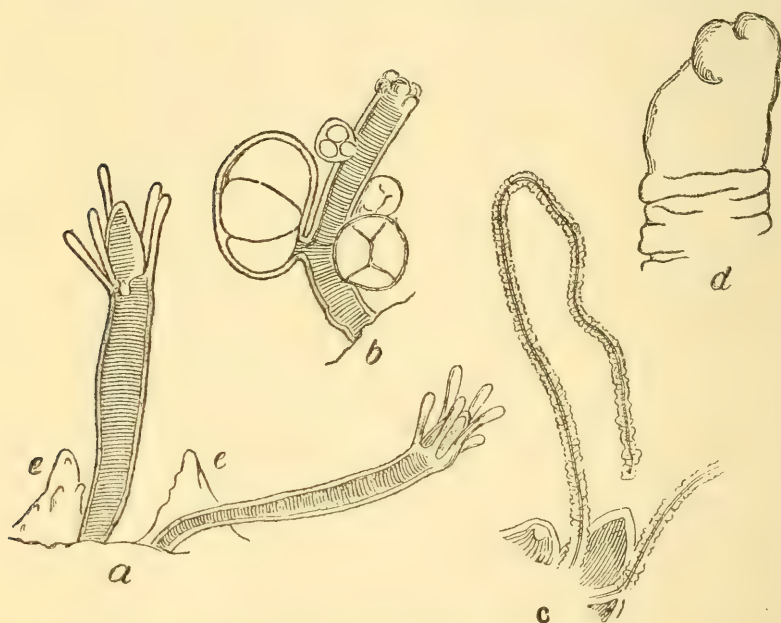


Fig. 7—*Hydractinia echinata*, Fleming. Enlarged.

(a).—Alimentary polypite.

(b).—"Select" polypite bearing the "Reproductive" buds containing ova.

(c).—Worm-like body ("tentacular filaments," Hincks), sometimes called dactylozooid.

(d).—Enlargement of head of the same.

(e).—Horny spine of "crust."

upon small creatures such as *Infusoria*, which may be attracted thereto. The possible benefit derived by the crab may be found in the protection afforded against enemies (Fish, etc.), by reason of the poison darts of the polypites, but the polypites reap the main advantage, since they are, almost without exception, found associated with the crab, whereas the latter is more often found not accompanied by them.

This is a particularly interesting species, and the horny skeleton should be examined with a microscope, in connection with that of *Coppinia arcta*, *Antennularia ramosa*, and several other species.

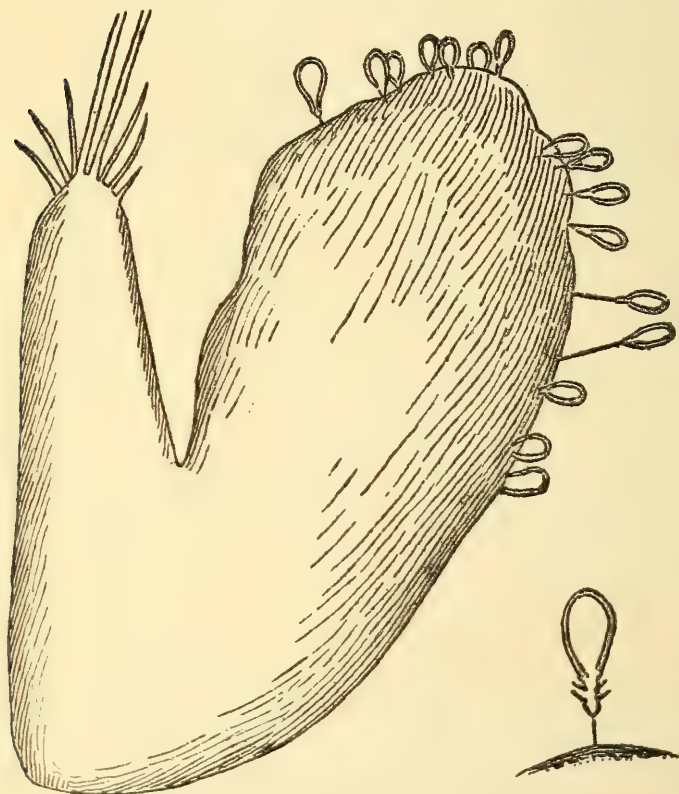
H. echinata is common along our shores in warm weather, but the crab with its commensal retires to deeper water when the temperature is low.

When thickly covered with gonophores, the whole colony is a pink colour, and very noticeable.

Family.—CORYNIDÆ.

Coryne vaginata, Hincks. (Fig. 8 & PLATE II.)

2 specimens in liquid.

SPECIMENS
4, 5.The polypite of *Coryne*, like that of the foregoing species, is club-Fig. 8.—A Goliath (*Cyclops*)(a).—Slain by the darts of *Coryne vaginata*, in various stages of penetration.

(b).—A dart much enlarged.

1.



2.

3.

E. C. Photo. ad nat.

1. *Tubularia coronata*. Abildgard.

2. *Coryne vaginata*. Hincks.

3. *Obelia gelatinosa*. Pallas.

(All nearly nat. size).

shaped. The tentacles are distributed over the body, but they differ in having the ends knobbed, the knobs being fully armed with dart sacks. The gonophores are round or oval in shape, and are formed between the tentacles. The main stem is erect, and rises to a height of four or five inches. It branches at intervals and becomes several times pinnate, the polypites being terminal. The polypary is regularly ringed, and extends to the base of the polypite, where it slightly expands and is more or less wrinkled.

Coryne vaginata is common in rock pools from mid to low tide.

Family.—EUDENDRIIDÆ

Eudendrium ramosum, Linnæus. (PLATE III.)

2 dry specimens.

SPECIMENS Polypites pink with many
6, 7. tentacles in a single circlet.
Stem long and alternately branching.
Polypites terminal. The polypary is of a dark to light brown colour, extending to the base of the polypite but does not then expand.

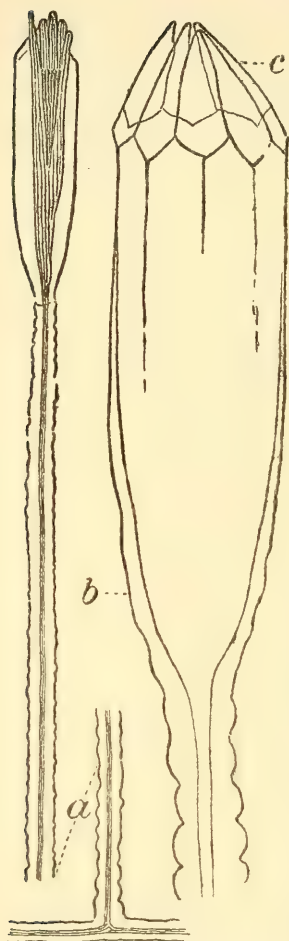


Fig. 9—A Hydroid.

(a).—The receptacle of which is furnished with a door or lid.

(b). — Receptacle enlarged.

(c).—Lid or 'operculum.'

Branches are annulated in the lower parts. This zoophyte is long and slender and of a switch-like character. It is trawled in shallow or deep water, and is rather common.

Eudendrium rameum,

Pallas.

2 dry specimens, 2 specimens in liquid.

SPECIMENS This species 8, 9, 10, 11. has been aptly compared with an old weather-beaten tree. The main stem and branches are thick and strong, being formed of many tubes adherent together. The terminal shoots consist of single tubes which are short. The polypary is slightly ringed in places; the gonophores



E. C. Photo. ad nat.

Eudendrium ramosum. Linnæus.

(Nearly nat. size.)

are borne in bunches, like grapes, on polypite or cœnosarc; they are plentifully distributed over the specimens preserved in liquid.

Family.—ATRACTYLIDÆ.

Perigoniums repens, Wright.

Specimen on shell, in liquid.

SPECIMEN The polypite is club-shaped with a
12. single circlet of tentacles, and arises by a stem from the creeping root-like cœnosarc. The polypary is of a reddish brown colour and extends to the base of the tentacles, where it expands into a cup-like receptacle, not, however, of such a finished character nor capable of covering the whole polypite as in the sub-order THECAPHORA. The gonophores are formed on the stem, the reproductive bud being a free medusa.

The species is rare at Hastings. It was trawled on *Nucula nucleus* together with *Lovénella clausa*, another rare species, on the same shell.

Garveia nutans, Wright.

3 specimens in liquid.

SPECIMENS The Hastings specimens are **13, 14, 15.** found creeping up the stems and branches of other hydroids, such as *Hydrallmania*, throwing up simple stems with polypites and coenosarc of a carrot pink colour, which readily catch the eye. The polypites are club-shaped. The tentacles number about twelve, and are in a single circle. The polypary is transparent and faintly ringed, and is expanded trumpet-wise, conformably with the polypites. The gonophores are round or oval, of an orange colour, and emerge from a slightly expanded polypary. The specimens were trawled off-shore, also from deeper water, and are somewhat rare. There are slight differences between the Hastings specimens, and those described and figured by Hincks, not, however, sufficient to warrant a fresh specific description, the main point of difference being, that in the present examples they are parasitic, and consequently do not require to form a strong compound stem.



E. C. Photo. ad nat.

Tubularia indivisa. Linnæus.

(Nearly nat. size).

Family.—TUBULARIIDÆ.

Tubularia indivisa, Linnæus. (PLATE IV.)

1 dry specimen and 1 specimen in liquid.

SPECIMENS The polypite of *Tubularia indivisa* **16, 17.** is ovate in form, and reddish in colour. There are two separate rings of tentacles, one around the mouth, and the other at about the middle of the polypite. The gonophores are formed at the foot of the body-tentacles in stalked clusters. The polypary is neither branched nor ringed, and extends upwards to the base of the polypite. In these Tubularians the need of a support for the polypites suggests itself very forcibly; the body seems top-heavy and liable to break off when swaying with the movement of the water. This species is common in shallow or deep water off Hastings, but grows much finer in the latter situation. It requires to be preserved immediately on being taken.

Tubularia coronata, Abildgard. (Fig. 10 and
PLATE II.)

1 specimen in liquid, also Medusoids in liquid.

SPECIMENS This species appears to be a rare **18, 19.** visitant to Hastings, and will, therefore, receive more notice here than would

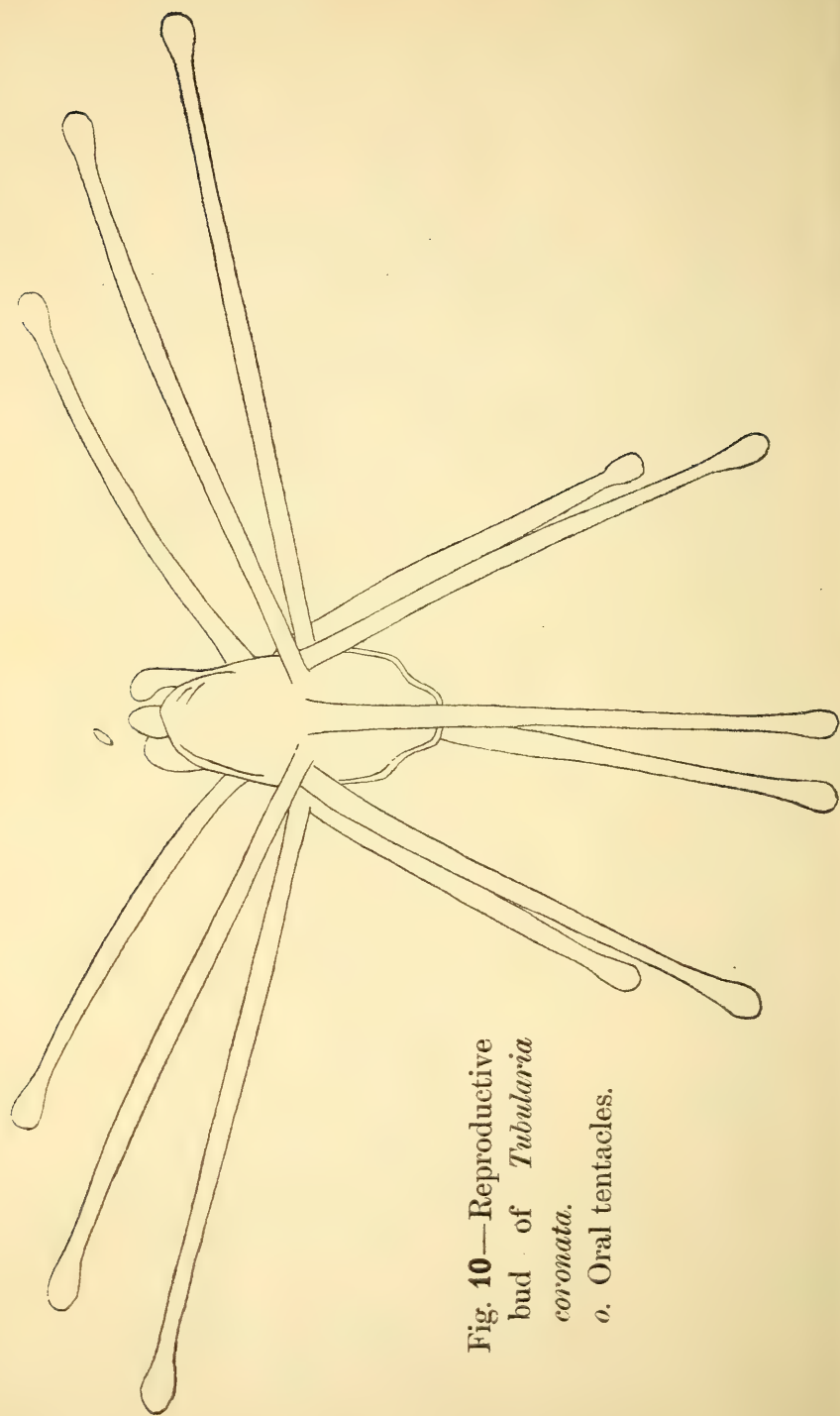


Fig. 10—Reproductive
bud of *Tubularia*
coronata.
o. Oral tentacles.

otherwise have been the case. The zoophyte in Hastings specimens is from an inch to an inch-and-a-half high and branches very little. The polypary is transparent, white, or flesh-colour. The general colour of the polypites is orange-red, but this, on close examination, may be observed to be confined mainly to the proboscis and gonophores.

The polypites are similar in shape to those of the last species. The mouth is surrounded by a ring of about twelve tentacles, and around the body, near the base, is another circle of transparent tentacles considerably longer than those around the mouth, and numbering about twenty-five. Just within this circle of tentacles the gonophores are situated; they are oval and borne on short stalks, and are generally of an orange-red colour. The reproductive bud, on liberation, is medusa-form, but without the bell, and of an elongated egg shape, with a slight constriction towards the basal or larger end. At the narrower end, where the mouth is situated, there are four short and thick tentacles which are very similar in size and appearance to the tubercles which are

noticeable at the apex of the gonophores before liberation. About midway down the body, there is a ring of much longer tentacles, clubbed at their ends. This feature appears to be an important specific character. These long tentacles number from about nine to twelve, each alternate one being raised, and the others lowered, with a slow finger-like motion.

On liberation, these little creatures appear rather sluggish in action and ill-adapted for locomotion, since they have no bell, nor are the tentacles specially suited for walking. It appears to be a matter of indifference to them whether they rest upon the base of the body, or on the tentacles. Hincks states that they can use the tentacles as oars. This method of progression was not noticed in the Hastings specimens, although these buds were given off in a glass vessel without persuasion. *T. coronata* appeared along the Hastings coast in the latter half of the year 1897, in great profusion, and was found from about half tide to low tide. Towards the end of the year, rough weather set in, and destroyed all the colonies, which, however, by this time,

had mostly shed their reproductive buds. Neither before, nor since this period, has this species been recorded for Hastings. It came in great profusion, and vanished suddenly, and completely. Possibly some unusual set of the sea-currents may have brought the embryos to this shore. The specimen in the preservative bears the gonophores, and the free reproductive buds will be found separately in a tube.

Sub-order II.—THECAPHORA.

Polypites provided with cup-like receptacle of the Polypary.

Family—CAMPANULARIIDÆ.

Clytia Johnstoni, Alder. (Fig. 11).

2 specimens in liquid.

SPECIMENS With this species is introduced
20, 21. those hydroids in which the polypary is extended, and expanded into a finely formed cup, so as to provide protection and support to the polypite. In *Clytia Johnstoni*, the unbranched stems rise from the creeping base bearing at the ends beautiful

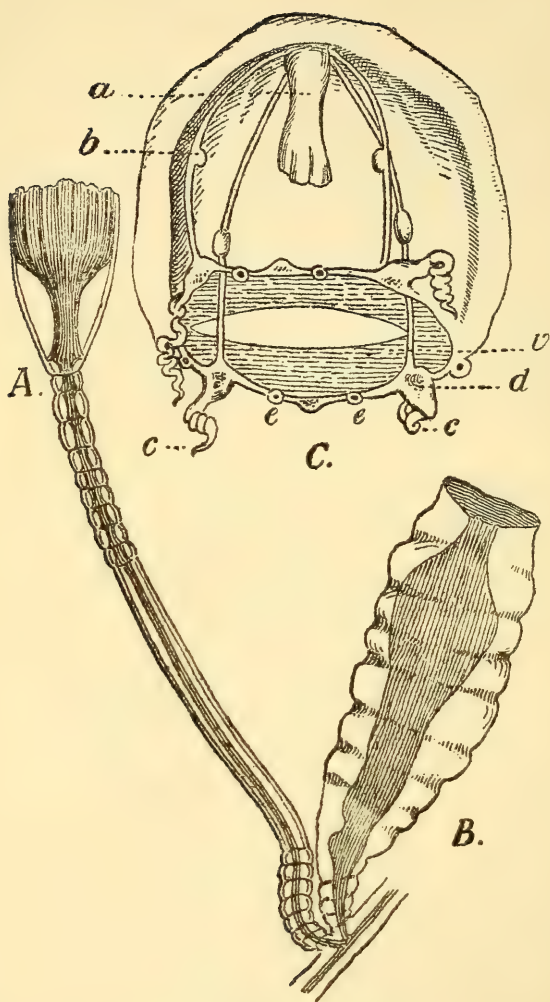


Fig. 11—A typical Hydriod *Clytia Johnstoni*,
with its free Reproductive bud, or Medusa.
(Enlarged.)

cup-like receptacles with toothed rims, in which the polypite is comfortably ensconced, and where it can expand or withdraw at will.

In the ATHECATA, two species (*Perigonimus repens* and *Garveia nutans*) have been mentioned in which a rough expansion of the polypary takes place, but there is a great difference between those species and the beautifully finished chalices of the THECAPHORA, of which *C. Johnstoni* forms a good example. The stems are ringed or wrinkled at the top and bottom, and occasionally in the middle. The polypite has a single circle of tentacles. The gonophores are borne on the creeping

(A).—"Alimentary" polypite, tentacles retracted.

(B).—"Select" polypite and modified receptacle, the reproductive buds being produced within the darkly shaded enclosure which represents the "Select" polypite.

(C).—The freed reproductive bud, or jelly fish, seen rather from below.

(a).—Stomach, or polypite, with the mouth at the free end.

(b).—One of the radiating canals, with reproductive sack.

(c).—Bell tentacles.

(d).—Organ of sight, Ocellus.

(e).—Lithocyst.

(v).—Veil, a thin membrane partly enclosing bell-cavity.

base, or occasionally on the stem, the horny receptacles or capsules of these being ringed or wrinkled. The reproductive bud is a free medusa with four canals radiating from the stomach to a canal around the margin of the bell. At each of these four points, there is given off a tentacle. Midway between these are swellings representative of other and rudimentary tentacles. On either side of these the eye-like lithocysts occur. The bell is a very beautiful object; transparent and finely spangled with opaque white dots. The mouth of the bell is partly closed by a fine membrane, the veil.

Obelia geniculata, Linnæus.

1 specimen in liquid.

SPECIMEN The genus OBELIA differs from the
22. genus CLYTIA mainly as regards the reproductive bud, which, as in the previous specimen, is a medusa, but the bell in OBELIA is almost flat or saucer shaped, and the tentacles around the bell are far more numerous. The creature has a peculiar habit of swimming sometimes with the mouth

uppermost, and the bell turned inside out. When in that condition, it is highly suggestive of an umbrella in a like predicament.

The specific name is very appropriate, signifying bent like the knee. It may be called the zig-zag hydroid, a term which equally well describes it. The hydroid throws up zig-zag stems, and from each bend rises a short ringed shoot bearing a polypite, the receptacle of which is somewhat triangular with a plain rim. The capsules which are large, and urn-shaped, are borne in the axils of the shoots. This species is very common and overruns many objects.

Obelia gelatinosa, Pallas. (PLATE II.)

1 specimen in liquid.

SPECIMEN

23. This is one of the tallest and most conspicuous of the shore* hydroids. The stem is compound, some five or six inches in height, with branches arranged in whorls around the axis; these, again, throw out secondary shoots. The polypary is ringed just above the branching, and the receptacles

* *i.e.* Growing on rocks, stones, &c., between tide-marks.

are somewhat deep, the rim of which, according to Hincks, is castellated, or squarely toothed. This character we have not observed in the Hastings specimens, although they must, undoubtedly, be referred to the same species. The capsules are borne in the axils of the branches and are about twice the size of the polypite receptacle.

This hydroid is found plentifully on stones and rocks near low water, very often in flat, exposed situations, and apparently it does not object to muddy surroundings.

Obelia longissima, Pallas.

1 specimen dry.

SPECIMEN

24.

This species is tall, delicate, and attenuated in mode of growth. The specimen when living, measured about twelve inches in height. The main stem is simple, with branches thrown out alternately around the axis, at which points, the stem bends slightly outwards, the polypary being ringed above the branching. The rim of the receptacle is squarely toothed as in the last species. The capsule is wider and not so elongated.

This species is common in deep water, and may be found amongst the trawlers' rubbish, where it has much the appearance of tangled horse-hair.

Obelia dichotoma, Linnæus.

1 specimen in liquid.

SPECIMEN This specimen is apparently *Obelia*
25. *dichotoma*. It bears a great resemblance in details to *O. gelatinosa*, and *O. longissima*, but differs from *O. gelatinosa* in habit, and in the stem being simple instead of compound; from *O. longissima* in form, habit, etc.; and from both because the rim of the receptacle is not toothed.

The specimen is on a fragment of *Tubularia*.

Not very common.

Campanularia verticillata, Linnæus.

1 specimen dry, 1 in liquid.

SPECIMENS This is a very distinctive species.
26, 26a. The stem is compound and throws out around its axis branches which branch again. The polypites are borne on rather

long straight shoots, more or less distinctly ringed, and the rim of the receptacles is indented. The capsules are somewhat oval, with the upper part gradually drawn out to a narrow neck. They are formed on the stem and branches generally. This has been called the Horse-tail hydroid, since it bears some resemblance to the plant *Equisetum*. It is not uncommon in the trawl from deep water, but is not a shore species.

Lovénella clausa, Lovén.

On specimen number 12.

SPECIMEN This is a beautiful and apparently
27. rare species. It throws up from a creeping base, simple, generally unbranched, stems, more or less ringed or wavy, with terminal polypites. The receptacles are deep and taper gradually downwards, the thickness of the chitine being greater towards the base. The rim of the receptacle is scalloped, producing slight angularity at each crenation. The special peculiarity of this species is, that when the polypite retires into the receptacle, pointed

prolongations of the receptacle are directed to a central point, and, closing over the polypite, form a conical roof. Capsules not present. Rare. (See Fig. 9.)

Opercularella lacerata, Johnston.

1 specimen in liquid, on a Polyzoan.

SPECIMEN An extremely delicate species, and
28. one very readily overlooked. In the present specimen, it is found running up the stem and branches of a polyzoan, *Anguinella palmata*, Van Beneden, from which, with great care, it could be removed. It gives off ringed undulatory stems with short ringed side shoots, bearing ovate receptacles. These are produced beyond the rim, with points, which meet conically over the aperture, forming a lid. The polypite is long and linear, and when expanded extends fully the length of the receptacle beyond it. The mouth is slightly conical, and the tentacles are long and number about sixteen. Capsules not present.

This species bears a very close resemblance, in many respects, to *Calycella syringa*, Linn.

Found near low water.

Family—LAFOËIDÆ.

Lafoëa dumosa, Fleming.

1 dry specimen, 1 specimen in box.

SPECIMENS This hydroid is found either
29, 30. twining up some other species or over running other objects, and in this, the creeping condition, the stem is simple (single). In another phase, the stem is erect and branching, in which case it is compound, as are also the branches. This habit of producing a compound stem is apparently induced by the need of stiffening and support for the zoophyte. The receptacles are tubular and somewhat curved. There is a short pedicel, and in the upright form the receptacles are arranged around the axis. Capsules not present.

This species is common in deep water.

Two other species, *L. pocillum* and *L. parvula*, Hincks. have been found locally.

Filellum serpens, Hassall.

1 specimen.

SPECIMEN The character of this species is
31. similar to that of the last, but the stem is creeping and reticulate, and is set in a

horny crust. The receptacles are curved, bearing some resemblance in shape to the old-fashioned powder horn. The lower half of the receptacle is adherent to the crust. *F. serpens* is very common on the stems of other hydroids, rarely on shells.

Family—COPPINIIDÆ.

Coppinia arcta, Dalyell. (FIG. 12.)

1 dry specimen in box.

SPECIMEN The receptacles are long, tubular,
32. and curved, and are set in a horny cellular crust which invests the tubes of other hydroids. A comparison of sections of this crust with that of *Hydractinia*, and the stem of *Antennularia ramosa*, and others, will be found instructive.

Common in the coralline zone.

Family—HALECIIDÆ.

Halecium halecinum, Linnæus.

1 specimen dry, of exceptionally fine growth.

SPECIMEN This has been called the herring-
33. bone hydroid, because the stem and main branches, which are compound, throw out regular, alternate, lateral branches.

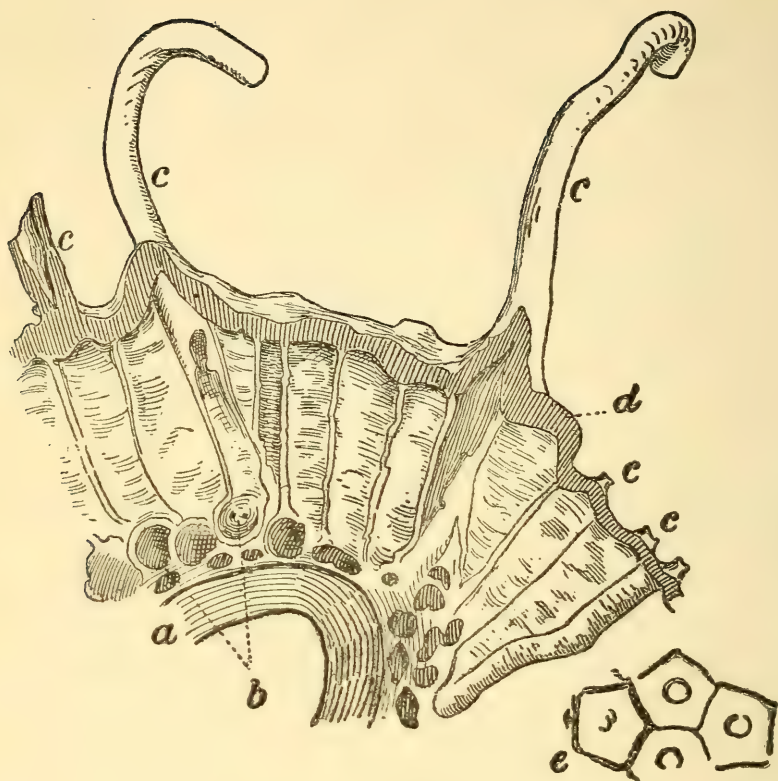


Fig. 12—Transverse section of polypary of *Coppinia arcta* for correlation with crust of *Hydractinia* (Fig. 7), and the section of stem of *Antennularia* (Fig. 13).

(a).—Zoophyte stem, upon which *Coppinia arcta* is parasitic.

(b).—Horizontal cells or tubes (?), from which arise the vertical tubes c.

(c).—Vertical polypite tubes.

The receptacle is tubular and telescopic in appearance. The male and female capsules differ in shape. Hincks* draws attention to the fact (it is well worth personal observation) that in the case of the female capsules of this genus, they are surmounted by two fully developed "select" polypites; and he cites this as the only case among the THECAPHORA in which these are not entirely suppressed. This fact should be carefully noted. In this species the mouth of the capsule projects beyond the ovary.

Common in the trawl, more especially in rather deep water, but is not of particularly fine growth.

(d).—Thick floor of chitine.

(e).—Appearance of tubes on surface.

In the horizontal cell or tube from which the left hand vertical tube arises, are seen two dots, which probably represent openings in connection with other tubes or cells. The system is practically the same as in *Hydractinia* and *Antennularia ramosa*, and others.

* *A History of the British Hydroid Zoophytes.* Vol. I. p. 221.

Halecium Beanii, Johnston.

1 specimen dry.

SPECIMEN *Halecium Beanii* may be known
34. from the last species by its very delicate character, and instead of the straight, rigid appearance, the tender branches are rather zig-zag, giving off the shoots at the angles. The "select" polypites are fully developed, as in *H. halecinum*, but the region of the capsule where the eggs are located, protrudes beyond the mouth of the capsule. This, however, is not so in the other species.

Family—SERTULARIIDÆ.

Sertularella polyzonias, Linnæus.

3 dry specimens, and 1 specimen in box.

SPECIMENS This family exemplifies
35, 36, 37, 38. those hydroids in which the receptacles are unstalked and arranged on opposite sides of the axis. This is a lowly and straggling form, the stem not being appreciably stronger or thicker than the branches. It overruns many objects, especially *Flustra* (a Polyzoon). The receptacles

are alternate, giving a slightly zig-zag appearance to the growth, and are not wrinkled as in *S. rugosa*. The capsules are ovate, wrinkled, and have a slight neck to the aperture. Very common.

Sertularella Gayi, Lamouroux.

2 dry specimens.

SPECIMENS This species bears much
39, 40. resemblance to the last, but has a compound stem, and consequently, a much stiffer appearance. The receptacles are slightly wrinkled and are alternate. The capsules are somewhat spindle-shaped, and are only wrinkled in the upper part.

Less common than *S. polyzonias*, and from the trawl only.

Sertularella rugosa, Linnæus.

1 specimen in box.

SPECIMEN This might be truly called the
41. wrinkled *Sertularella*. The specimen exhibited has overrun a piece of *Flustra* (a Polyzoon), throwing up here and there

small shoots, densely crowded with ovate, alternate receptacles; features in which, as also in the marked wrinkling, they much resemble the capsules, which, however, are very much larger. Common.

Sertularella tenella, Alder.

1 specimen in box on *Flustra*.

SPECIMEN 42. This specimen appears to combine to a great extent, the characters of *S. tenella*, Alder, and *S. fusiformis*, Hincks. The stem is very zig-zag, the angles formed being almost right-angles. The receptacles are too short for *S. fusiformis*, and although apparently smooth, in most instances this is probably due to the age of the specimen, as in some specimens they are wrinkled. The rim is four-toothed. The capsules are oval, ribbed, and with dentate apertures, but in many cases they appear plain. It is a pretty little species and nearly allied to *S. rugosa*.

Diphasia rosacea, Linnæus.

2 dry specimens, and 2 specimens in boxes.

SPECIMENS 43, 44, 45, 46. This a most delicate and elegant species. It is generally found trailing over hydroids and



E. C. Photo. ad nat.

Sertularia pumila, Linnæus.

On stems of *Fucus serratus*.

(Three-fourths nat. size.)

other objects, throwing up stems, curving and tendril-like towards the tips, which grasp any object for support. Side branches, which hardly differ in size from the stems, are given off alternately; the receptacles are tubular and occur on both sides of the stem oppositely. The apertures are furnished with a lid or operculum. The capsules differ in each sex; the male is cylindrical in shape, lobed lengthwise, and surmounted by a crown of spines; the female is somewhat pear-shaped, with a supplementary chamber for the maturing ova, and with two prominent incurved spines at the crown. Specimens showing both forms of capsule are exhibited in the glass-topped boxes.

Common in the trawl.

Sertularia pumila, Linnæus. (PLATE V.)

2 dry specimens on sea-weed.

SPECIMENS *Sertularia pumila* covers with
47, 48. great profusion, various sea-weeds between mid and low tide. It is of a stronger and closer build than *S. gracilis*, but shorter and more branching, the branches often being

opposite. The receptacles are tubular and opposite; the capsules are ovate, tapering to a short pedicel. There is a slight collar to the aperture. Very common.

Sertularia gracilis, Hassall.

1 dry specimen, and 1 specimen in box.

SPECIMENS A species of particularly fine
49, 50. habit. It is symbiotic on other hydroid stems, over which it grows, throwing up short and fine stems. The receptacles are opposite and tubular, the rim being sharp. The female capsule is ovate with a narrow collar-like aperture. They may be seen on the specimen in the glass-topped box.

Not common.

Sertularia operculata, Linnæus. (PLATE VI.)

2 dry specimens, and 1 specimen in box.

SPECIMENS The stem of this species is very
51, 52, 53. delicate, branches distantly in a dividing manner, and produces colonies of enormous extent, and luxuriant in growth. It has been called the "sea hair" hydroid. The



E. C. Photo. ad nat.

Sertularia operculata, Linnaeus.

On stems of *Laminaria*.

(Six-tenths nat. size.)

The Scale is 10 Cm.

receptacles are tubular and are arranged oppositely on each side of the stem ; the outer lip of the margin being very sharp and pointed. The capsule is somewhat balloon-shaped, with a plain aperture. It is often symbiotic on *Laminarian* stems and Mussel valves. It would hardly be venturing too far to say, that the colony here shown on the *Laminarian* stem (see plate VI.) probably equals in number the population of London. The previous species might be regarded as a dwarfed form of the present ; *S. operculata*, however, is vastly more profuse in its growth. It is common in the trawl.

Sertularia abietina, Linnæus.

4 dry specimens, and 1 specimen in box.

SPECIMENS This species has been
54, 55, 56, 57, 58. popularly called the
“Sea-fir.” The main stem grows to a
considerable height, and throws out alternate
lateral branches which in some specimens
branch again. The receptacles are
sub-opposite ; the capsules are ovate,

wrinkled, and slightly tapering at the base. Often grows upon scallop valves and on rocks. Trawled from rather deep water.

Sertularia argentea, Ellis and Solander.

2 dry specimens, and 1 specimen in box.

SPECIMENS This is a very elegant species. **59, 60, 61.** The stems produce alternate short branches, each branch giving out other short branches in a palmate manner. The receptacles are sub-opposite and sharp-tipped. The capsules are somewhat shield-shaped. Trawled from moderately deep and very deep water.

This species, and *S. cupressina* are often chosen for decorative purposes.

Sertularia cupressina, Linnæus. (PLATE VII.)

2 dry specimens.

SPECIMENS Somewhat like the last species in **62, 63.** habit, but the stem is much longer and more tapering. It throws out short branches, mainly alternately, which immediately fork and re-fork in a palmate



E. C. Photo. ad nat.

Sertularia cupressina, Linnæus.

(Three-fourths nat. size.)

manner, as in the previous species. The receptacles are sub-opposite and directed forward. The outer lip of the aperture is sharp and pointed. Receptacles and stems both have a slightly compressed appearance. The capsules are of an elongated shield shape, the upper corners being prolonged into spines; they are numerous on the specimens exhibited. Not uncommon in the trawl, or thrown upon the shore.

Hydrallmania falcata, Linnæus.

3 dry specimens and 1 specimen in box.

SPECIMENS The stem is long and spirally
64, 65, 66, 67. twisted, giving off alternate, regular, pinnated, palm-like branches, each pinna or side-branchlet bearing on its inner side only, the jug-shaped receptacles, which are crowded together. The capsules are oval, with a slight collar to the aperture. The spiral stem gives to this species a specially graceful character.

Very common in the trawl and often along the shore.

Family—PLUMULARIIDÆ.

Antennularia antennina, Linnæus. (PLATE VIII.)

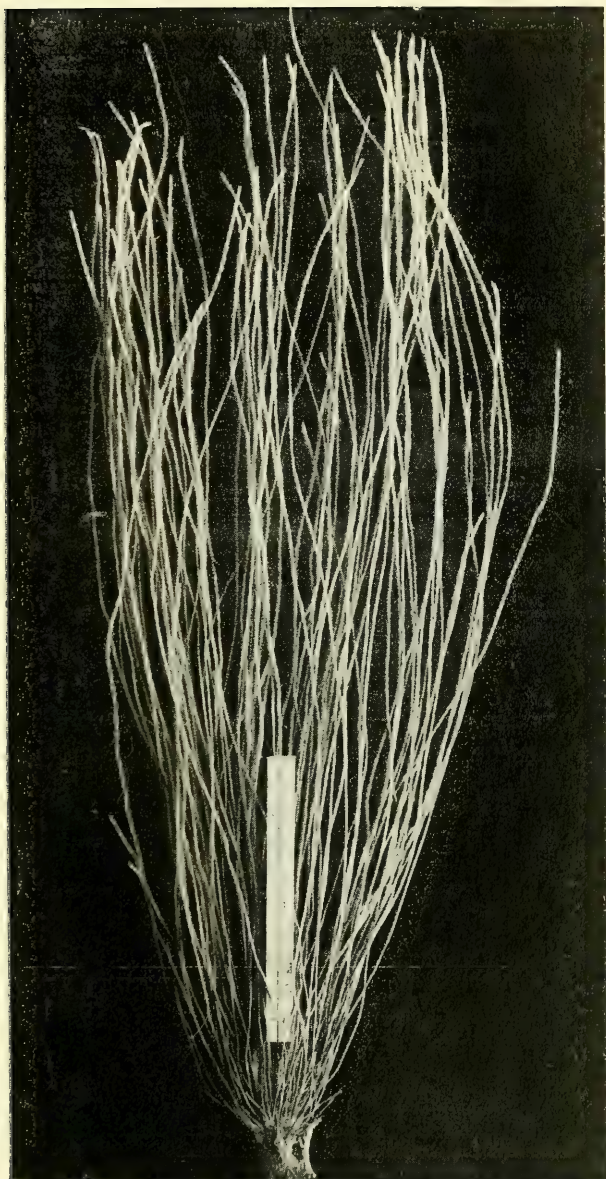
2 dry specimens and 1 in liquid.

SPECIMENS This species has been well named
68, 69, 70. the "Antenna-like" hydroid.

It throws up long, straight stems, and at short intervals, gives out in nodes, like the plant *Equisetum*, short, fine, radiating branches, bearing on the upper side only, shallow tea-cup-like receptacles. Nematophores are plentifully distributed, one on either side above, and one below each polypite, with others on the stem. The capsules are oval with an oblique truncated aperture. They may be seen on the specimen preserved in liquid, likewise the fine branches and receptacles.

This species is generally found growing on scallop valves in deep water, and is common off Hastings.

Two very curious species of Nudibranch Molluscs, *Doto Coronata* and *D. pinnatifida*, feed upon the polypites, and also attach their spawn to the stems.



E. C. Photo, ad nat.

Antennularia antennina, Linnæus.

(Four-tenths nat. size.)

The Scale is 10 Cm.

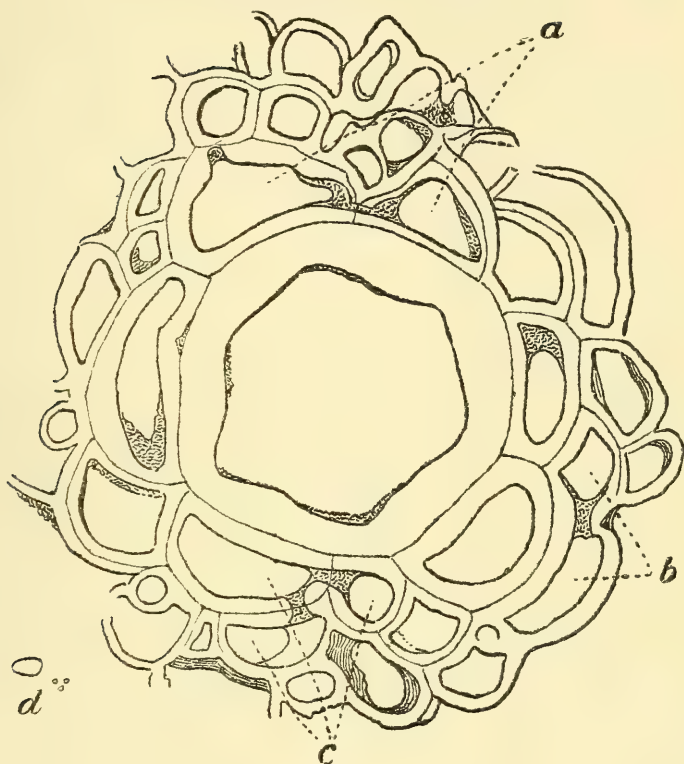


Fig. 13—Transverse section of stem of *Antennularia ramosa*, Lamarck. (Magnified).

(a b c).—Tubes opening into one another.

(d).—Dart sack from cœnosarc.

Antennularia ramosa, Lamarck. (PLATE IX.)

2 dry specimens, 1 specimen in liquid.

SPECIMENS This species does not attain so
71, 72, 73. great a height as the last; the
 stems, also, branch frequently, although

somewhat irregularly. The stems and the branches throw out at the nodes, delicate radiating offshoots, bearing receptacles on the upper sides. These are similar to the receptacles of the last species, but the nodes are much closer, and there is some variation in the distribution of the nematophores. The capsules are horn-shaped, a drawn out and curved variation of those of the last species. The stem and branches of this species will repay microscopic examination. A transverse section (see fig. 13) shows many other tubes of various shapes and sizes running parallel with, and arranged around, the main tube, pressed tightly against each other, and annealed together. Many of these tubes open into those adjoining and into the main tube; the *cœnosarc*, therefore, is uninterrupted.

Not uncommon on the scallop valves in deep water.

Aglaophenia pluma, Linnæus. (PLATE X.)

2 dry specimens, also 1 in liquid and 1 in box.

SPECIMENS After storms, when seaweed in large quantities is thrown upon the beach, *A. pluma* may frequently be found on *Halidrys siliquosa*,



E. C. Photo. ad nat.

Antennularia ramosa, Lamarck.

(Five-sixths nat. size.)

Lyngb, It winds its loose mesh of fibres around stem and branches, and throws out, in every direction, graceful, pinnated plumes, which resemble fronds of tree-fern or palm. The receptacles which are somewhat cup-like, with the margin irregularly dentate, are borne on one side only of the axis. The nematophores are confined to the region of the receptacles, and their peculiar movements are worth attention. The capsules in this, and some other species are additionally protected by a modification of the palm-like branches; the delicate side branches being folded around the capsule to which they are united. These "ribs" are studded with nematophores.

Plumularia pinnata, Linnæus (Figs. 14, 15.)

3 specimens in liquid.

SPECIMENS A very lovely and delicate species
78, 79, 80. of a semi-transparent, white hue. The creeping base throws up stems regularly and alternately branched, which, towards the apices, curl over like a feather. The receptacles are arranged along the upper side of the branches. The gonophores are crowded

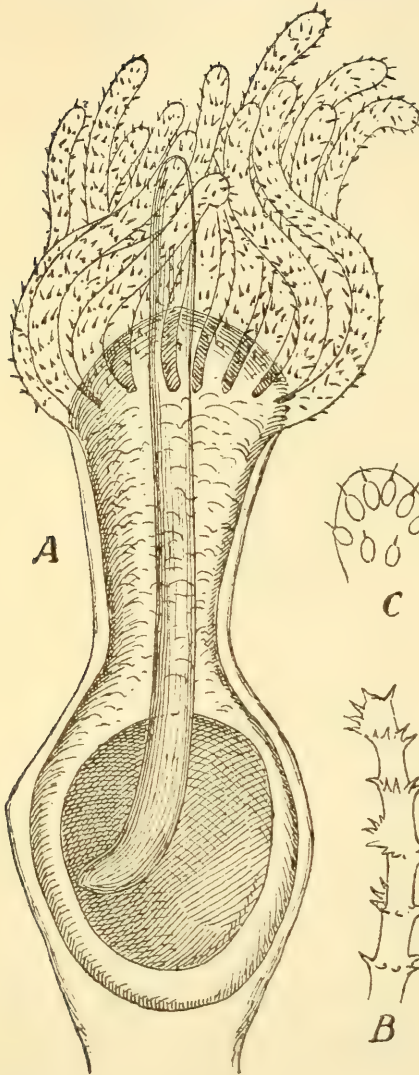


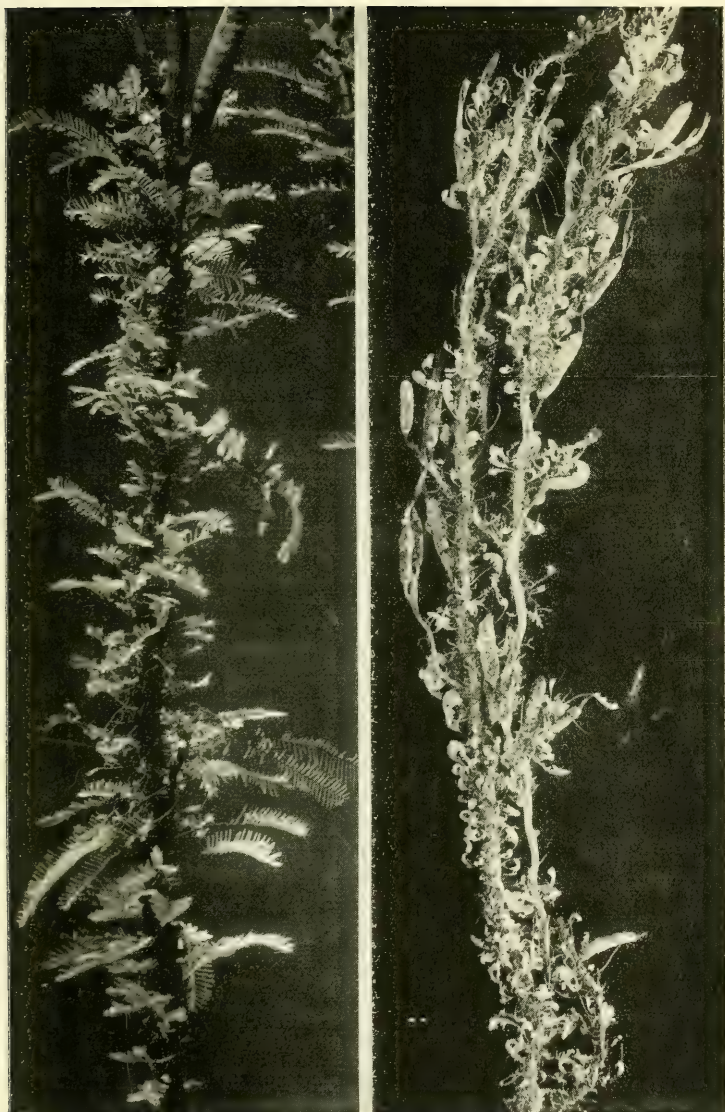
Fig. 14—A polypite of *Plumularia pinnata* expanded and gorging a worm; also enlargements of tentacle and dart cells *in situ*. Enlarged.

(a).—The polypite.

(b).—A portion of a tentacle. Much enlarged.

(c).—Eight dart cells, *in situ*. Magnified.

The first operation on the part of the polypite was to throw out a number of darts, and then to get the tail end of the worm between the tentacles and gradually draw it down into the stomach. Owing to the mucus on the body of the worm, the darts did not appear to affect it much, and after the lapse of half-an-hour, it was still living, although its tail end was probably being digested in the stomach of the polypite.



LIVING.

DEAD.

E. C. Photo. ad nat.

Aglaophenia pluma, Linnæus.

On stems of *Halidrys siliquosa*.

(Both half nat. size.)

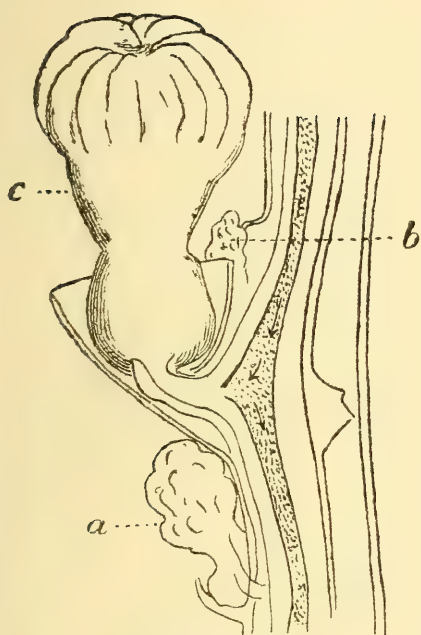


Fig. 15—

(a).—A polypite of *Plumularia pinnata* (enlarged).

b).—Showing amoeboid bodies ("nematophores.")

(c).—Polypite.

together on the main stem. They are somewhat pear-shaped and lobed lengthwise, and project more or less into spines in the upper part. Hinck's description of this species appears to be rather too restricted. There is some difference between the deep sea and the shore forms, and he probably gave more attention to the former variety. In the beautiful specimen of the

shore variety exhibited, several joints occur between the polypites; and the nematophores are more generally distributed than one would expect to find from Hincks' description. In

the shore variety, there is one nematophore above and one below each polypite, and in many cases, either one or two in the axils of the branches. There seems also to exist considerable variation in the development of the capsular spines, so that one can hardly help recognizing the close connection of the three species, *pinnata*, *echinulata*, and *similis*. A rather poor specimen of the deep sea form is exhibited. This form is somewhat rare, but the shore variety is common in rock pools from mid to low tide.

Plumularia setacea, Ellis.

1 specimen in liquid on *Antennularia* stem.

SPECIMEN Extremely delicate, branches at a
81. less open angle than the last species; the capsules are elongated spindle shape, quite distinct from other forms, and are produced in the axils. They are decidedly the best specific character. Nematophores plentifully distributed. Rare at Hastings. Not observed as a shore form.

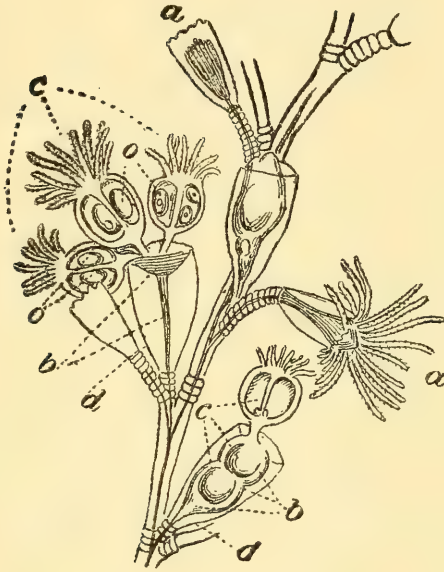


Fig. 16—*Gonothyræa Loveni*, Allman. Enlarged.
(After Hincks).

(a).—Alimentary polypite.

(b).—That which represents the “select” polypite.

(c).—The “reproductive” bud in various stages of maturity, the most matured containing ova. In this case it fails to become detached.

(d).—The horny receptacle, or “capsule.”

(e).—Ovum.

GLOSSARY.

Alimentary polypite. The polypite whose only duty is to obtain and assimilate food.

Athecata. The word means "sheathless," and is applied to the Lower Division of the Hydroida, in which the polypite is not protected by a horny receptacle, as in the Higher Division.

Capsule. Strictly speaking, the well formed horny receptacle or case which encloses in the Thecaphora all that represents the "select" polypite, together with the reproductive buds containing the ova. It is often applied to the whole body thus represented.

Cœnosarc. The word means "common flesh," that is, that portion of the compound animal structure, in the Hydroids, which is common to, or which connects, the individual polypites.

Gonophore. The reproductive bud with its envelope, as occurring in the Athecata, and where it is distinct from the polypite or bud which bears it.

Nematophore. The word signifies "thread-carrier," in allusion to the threads, or tubes of the darts with which the nematophores are often associated. They are peculiar amœba-like bodies (sometimes called "guard-polypites"), and are found associated with polypites, and also on the stem and branches in the Plumulariidæ.

Planule. The larval form into which the egg, after segmentation, develops, prior to its transformation into the polypite.

Reproductive bud. Special egg, or seed-bearing buds.

"Select" polypite. Certain of the alimentary polypites told off to bear the special reproductive egg-producing buds, and which are generally more or less modified in consequence.

Thecaphora. The word means "sheath-bearer," and is applied to the Higher Division of the Hydroida, in which the polypites are provided with a horny receptacle.

ANNOTATIONS

— MADE BY P. R. IN —

“A History of British Hydroid Zoophytes,”

— BY —

THOMAS HINCKS, B.A.

While looking through some of Mr. Rufford's books, I have been much interested in perusing the annotations made by him on the pages. Many of the remarks are exceedingly brief—simply three or four words—others are of the nature of a short sentence, while a few are somewhat lengthy. A very large number occur in the “Manuel de Conchyliologie,” they do not, however, bear directly upon the Conchological section, p. 107, *et seq.* in this book. Those which are of most interest at the present moment, are written on the pages of Hincks' “History of the British Hydroid Zoophytes.” I have thought that several of the more important annotations may prove of interest to the general reader as well as of value to the student of Hydromedusæ. It has been necessary to quote from the text of Hincks' work somewhat extensively, but only so much as to preserve a continuity of idea, and to show the application of P. R.'s remarks.

Page XI., line 12 from the bottom.

Concerning Thread-cells in Ectoderm of Cœnosarc and Gonophore, Hincks writes: “The thread-cell is a most interesting piece of structure. . . . Two kinds of thread-cell are often met with on the same species. Besides

the formidable instruments with which the tentacles are armed, large, bean-shaped cells are sometimes crowded together in immense quantities, as, for example, in the ectoderm of the cœnosarc in *Hydranthea*, and in the outer covering of its gonophore. It is difficult to imagine what relation these can bear to the economy of the animal."

To this Mr. Rufford adds the following :

"The thread-cells on Ectoderm of Cœnosarc and Gonophore may be of service when some member of colony is defunct ; as I have frequently seen Infusoria, etc., invade the space between Cœnosarc and polypary, having obtained access through the decay of one or more polypites. In some cases, however, I believe the decaying end is closed."
P. R.

Page XIX., line 9 from the top.

"In the genera *Hydractinia* and *Podocoryne*. . . . some curious appendages occur in addition to the alimentary polypite. . . . We have first the spiral bodies."

These Mr. Rufford designates as "Snake-like zooids in *Hydractinia*."

The place of development of these appendages, and the energy they display is then described in the text. At the end of this paragraph "They usually form a somewhat dense fringe round the mouth of the shell [which is almost always* tenanted by a Hermit crab], and are roused from

*The words "almost always" are underlined with pencil.

their state of quiescence by anything that may irritate the surface of the Cœnosarc," this marginal note appears :

"Is there any exception? and what evidence is there that the crab has not just left the shell?" P. R.

Page XXI., first 25 lines.

In the margin at the side of the section dealing with the reproduction of a Hydroid colony; the following is written :

"In Thecaphora, buds reproductive spring from Cœnosarc and are protected. In Athecata, buds usually developed on body, but sometimes on Cœnosarc, and are unprotected." "Buds borne on special zooids which become atrophied and then resemble the capsuled gonophores of the Thecaphora."

The latter note is more of the nature of a summary of a portion of the text, than the expression of a new idea. It is, however, instructive and interesting.

Page 24, line 14 from the top.

With reference to the habit of *Hydractinia cchinata*, Hincks states that it occurs on univalve shells tenanted by Hermit crab. A marginal note states :

"Also on the claws of lobster." P. R.

This is probably a unique, or at least, unusual, situation for *Hydractinia echinata*.

Page 103, line 5 from the top.

Appended to the habitat of *Garveia nutans*, is the following footnote :

“Hastings.* Polypite (wholly) and cœnosarc carrot-red, Polypary transparent, colourless (like water), more or less faintly annulated. Branches wriggling and springing from stolons entwined on stems and branches of *Hydrallmania*. No gonophores. End of March, '95.” P. R.

Page 119, line 12 from the bottom.

Tubularia coronata, Abildgaard.

The following appears in the margin of p 119 :

“This species appeared suddenly on the Hastings shore in the latter part of 1897, and was very abundant, but a storm about the end of the year destroyed all the colonies.—I obtained some of the gonozoids which were shed, in a glass vessel, without persuasion. They were very inactive, not knowing whether to stand on their base or on the tentacles, but rather preferred the former. Alternate tentacles were raised or lowered, The tentacles are knobbed. (p. 120). In the Hastings specimens, there appeared to be very little

* Signifies that Mr. Rufford had discovered this species in Hastings district. Three specimens in liquid are exhibited in Hastings Museum, see also p. 48.

branching, if any. I never saw this specimen here [*i.e.*, at Hastings] before." P. R.

"N.B.—The knobbed tips to tentacles of gonozoid fixed it as this species."

For illustration and description of this species see plate II., Fig. 10, and pages 49-53 of this volume.

Page 295., line 10 from the top.

Plumularia pinnata, Linnæus.

"Shoots clustered, *tall, white, or of a pale horn-colour*," etc., etc., Hincks. Marginal note:

"I have found some specimens a bright yellow to orange. Here and there, however, the ends of pinnæ were colourless." P. R.

Ibid, line 3 from the bottom.

"The calyces of *Plumularia pinnata* are only separated by a single joint, those of *Plumularia setacea* by two." Hincks. An asterisk at the word "joint," draws attention to the following footnote:

"Not always, by any means, in the *shore variety* at Hastings, although it holds good, to a great extent, with the deep sea form." P. R.

Hincks, continuing the description of this species remarks (p. 296, line 7 from the top): "A much safer criterion (as regards distinctive marks of the species) is to be found in the nematophores, which are scantily developed and exhibit a very peculiar structure."

"This will not hold good, either, for the shore form at Hastings (specimens with well matured gonophores) shows a nematophore above and one below each polypite, and often

This does not appear to accord with Mr. Rufford's investigations, as the following footnote on the same page indicates.

one or two in the axils of the branches. Moreover, there is considerable latitude in the degree in which spines are developed on the gonophores." P. R.

Also in the letterpress of the same page (line 13 from the top) it is stated: "When present, the reproductive capsules afford another good specific character;" Mr. Rufford's observations had led him to regard the reproductive capsules as "the best" specific character, and noted such in the margin (line 9 from bottom), he also added,

"The deep-water specimens are of the larger size . . . and differ in other respects."

There are a few other marginal comments, such as "common in trawl," "on other Hydroid stems," and numerous summaries of paragraphs, which, however, would serve no useful purpose if quoted.

E. G.

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